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ABSTRACT

One of a series of 18, this Child Development Associate (CDA) trainin module provides a guide tc develcping mathematical ability in preschool children. Objectives state that upon completion of the module the CDA trainee will be able to provide daily opportunities for math-ccncept development, provide problem solving activities, sequence math experiences from simple to complex, provide a mathematics center, plan, execute and evaluate at least five learning experiences in math, and execute and evaluate a minimum of five unplanned experiences for developing math ccncepts. Early sections of the module define terms and suggest a procedure by which trainees can evaluate their strengths and weaknesses. Subsequent chapters discuss the teacher's responsibility for mathematics in the preschool, teaching mathematics in the preschool, and learning activity development. Fourteen examples of learning activities and an observation guide for evaluating learning centers are provided for the CDA trainee. Supplemental reference books, pamphlets, children's books, and films are listed. (BH)

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The Child Development Associate Pilot Project, funded by the U. S. Department of Health, Education and Welfare, Region VI, Office of Child Development, was awarded to Eastern Oklahoma State College in the fall of 1973, where during the next two years, draft materials for competency-based training was developed. In the fall of 1975, Oscar Rose Junior College was contracted to review and revise the materials for publication. The following individuals have provided the expertise and assistance for completion of the Oklahoma Child Development Associate curriculum materials.

OKLAHOMA CHILD DEVELOPMENT ASSOCIATE POLICY ADVISORY COUNCIL 1973-76

Mayme Jackson, Chairperson 1973-76
Sally Augustine 1973-76
Marcie Banks 1975-76
Anita Buford 1975-76
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OSCAR ROSE JUNIOR COLLEGE 1975-76

Susan C. Loveless, Project Director
Sue Williams, Child Development Specialist
Jane Thomas, Child Development Specialist
Dolores Stegelin, Child Development Specialist

EASTERN OKLAHOMA STATE COLLEGE 1973-75

Dale Chlouber, Project Director
Dixie McKinzie, staff 1973-75
Mary M. Dunkin, staff 1973-74
Barbara Ross, staff 1974-75
Pamela Hill, staff 1974-75
Lynn DuChateau, staff 1974-75

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CHAPTER I

INTRODUCTION

RATIONALE

Rudimentary mathematical skills and understandings are being established before children enter school. They are making judgments, the beginning of the reasoning process. The principle of mathematics is discovery. Children begin to use numbers as words before they learn to count, for numerical meaning is discovered through solving a problem.

The world of mathematics, with its related concepts of time and space, require abstract thinking. This ability develops slowly in comparison with other development. A variety of materials and experiences must be available for children to explore and discover the mathematical concepts.

Organizing and understanding mathematical concepts should be an integral part of the curriculum for young children. These children should be provided opportunities for applying these concepts to everyday situations to enable them to internalize such concepts.

Accomplishment of the objectives in this area will foster the individual's development of the following competencies as defined by the Child Development Associate Consortium:

Competencies:

II. Advances physical and intellectual competence.

III. Builds positive self-concept and individual strength.

IV. Promotes positive functioning of children and adults in a group.

OBJECTIVES

Upon completion of this area the trainee will be able to:

1. Demonstrate the importance of mathematics in the preschool curriculum by providing opportunities daily for math-concept development.

2. Demonstrate the contribution of mathematics to the development of problem-solving abilities by providing such activities in the curriculum.

3. Demonstrate the ability to sequence mathematics experiences for children from simple to complex.

4. Provide a mathematics center with material to develop math-concepts in the children.

5. Plan, execute, and evaluate a minimum of five learning experiences in math.

6. Execute and evaluate a minimum of five unplanned experiences for developing math-concepts.

CHAPTER II

DEFINITIONS OF TERMS

1. Cardinal numbers---Numbers describing the size of a collection of objects, such as 1, 2, etc.

2. Classification---Grouping such as by color, size, shape, etc.

3. Empty set---A set which contains no elements.

4. Equivalent set---Sets having the same number of members.

5. Member or element---A specific object referred to in a set.

6. Number---An idea or way of thinking about individual objects.

7. Numeral---The symbol for a number. Our numerical system, the Hindu-Arabic system, uses ten numerals. These are: 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9.

8. Non-equivalent set---Sets having a different number of members.

9. One-to-one correspondence---The exact match of objects developed.

10. Ordinal numbers---Numbers indicating the position or order in which they come.

11. Rational counting---Counting to find out how many.

12. Rote counting---The repeating of numbers in proper sequence from memory, without realizing the meaning.

13. Set---A collection of things or objects with something in common.

CHAPTER III

SELF-EVALUATION

To determine your competence in this area, read through the rationale and objectives in Chapter I and check those which you can perform successfully. This will provide an indication of your strengths and weaknesses.

Discuss this evaluation with the trainer/supervisor to determine the classroom and field experiences that will enable you to demonstrate competence in each objective.

If your self-evaluation and interview indicate that you can demonstrate competence in each objective, request an advanced-standing examination from your trainer.

CHAPTER IV

TEACHER'S RESPONSIBILITY FOR MATHEMATICS IN THE PRESCHOOL

RATIONALE

At the preschool level, mathematical instruction should emphasize the development of reasoning processes and the creation of a positive attitude toward mathematics as a continuing part of life.

It must be remembered that much of the child's ability to form concepts is developmental in nature rather than imitative, and is dependent upon the individual child's physical and mental maturity, plus the individual's own experience.

Before children can solve problems involving numbers, they must comprehend the relational concepts of classification and seriation. Also they must have had the experiences related to number goals: one-to-one correspondence and conservation.

ESSENTIAL CONTENT INFORMATION

I. Objectives for Mathematics in the Preschool:

A. Help children to think creatively in the area of mathematics.

B. Assist children in learning mathematical skills at their individual developmental levels and rates.

C. Help children to organize mathematics in the world around them.

D. Develop readiness skills necessary for the children to later solve number problems.

E. Develop the children's reasoning abilities rather than mathematical computation skills.

II. Principles to Follow in Presenting Mathematical Concepts:

A. Concepts must be introduced gradually.

B. The most basic aspect of a concept must be introduced first and gradually built upon.

C. Concepts should be introduced sequentially.

D. New materials which are introduced should build on learning that has already taken place.

E. Introduce new materials only as the individual child is ready for it, since the rate will vary from child to child.

F. The children should experience math concepts that are presented through their senses and through motoric involvement.

G. Different activities and types of materials should be used to present one concept many times because repetition is essential for understanding.

H. Emphasize the development of reasoning processes rather than memorization or computation skills.

III. Presentation of Mathematical Concepts:

There is a lack of agreement among various authorities as to the specific sequence in which math concepts are introduced. Piaget and others do say that children must master the relational concepts of seriation and classification as well as one-to-one correspondence and conservation before being able to solve problems involving numbers.

A. Classification.

Grouping items according to similarities and differences.

1. Preschool children can group according to only one property at a time, e.g., the child sorting wooden chips of different sizes and shapes, can only think of the color of the chips or the shape of the chips at one time.

2. Classification skills are a prerequisite to solving numerical problems.

B. Seriation.

Seriation is being able to make two or more comparisons and order items along some dimension.

1. It differs from classification in that classification is the grouping of objects only; it ignores the "ordering" within the group.

2. Size discrimination is the prerequisite for seriation.

3. Seriation tasks should first be done with two objects of great difference in size; the child should be able to (verbally) label them as big and little. Then three objects would be introduced, then four, etc.

4. Objects seriation should be mastered before picture symbols are introduced.

C. Developing Elementary Numerical Concepts.

Before children can solve numerical problems involving quantity and measurement, they must be able to do more than count. The child must be able to perceive differences in properties for which seriation and conservation have provided the background. The following outline shows the sequence for teaching number, numeral, and set. Preschool children will probably not advance through all the steps or will only gain very basic understanding of some.

1. One-to-one correspondence. Two sets are equivalent in one-to-one correspondence if each element of one set is exactly duplicated in the other, e.g., one row of checkers is matched exactly in placement of another row of checkers.

   a. Children believe what they perceive.

b. Children identify quantity with the amount of space that is occupied. For example: put six checkers in a row very close together and six in a row spread out; then ask the children which row has more. They will point to the one that is spread out.

c. One-to-one matching activities helps children build a logical basis for judging amount.

2. Conservation.

The amount of space, matter, or weight remains the same, even though the form is changed, if nothing is added or taken away.

a. Children do not master conservation until about seven years of age.

b. Children must be able to conserve before they can really understand number problems.

c. Activities that emphasize conservation help to begin the children's logical thought processes.

d. Conservation activities deal with arranging, disarranging, and rearranging.

3. Counting experiences.

Counting experiences are divided into two areas: rote counting and rational counting.

a. Rote-counting---The repeating of numbers in proper sequence without realizing the meaning of the number.

b. Rationale counting---Counting to find the number of objects in a group with an understanding of the relationship between the number and the quantity.

4. Geometric shapes.

An understanding of the size and shape of objects and places in the environment.

a. Shapes to introduce:

(1) Circle.

(2) Square.

(3) Triangle.

b. Skills to introduce:

(1) Shape discrimination.

(2) Naming shapes correctly.

(3) Generalizing shapes to other aspects of the environment.

5. Sets.

a. A well-defined collection of objects that is either a perception of objects or a mental pattern of thinking.

b. Skills to develop:

(1) Building sets---equivalent and non-equivilent.

(2) Naming a set.

(3) Reproducing a set.

(4) Associating cardinal numbers.

6. Cardinal numbers.

   a. The name and use of the symbol which shows quantity.

   b. Skills to develop:

      (1) Understanding of concepts 1-9.

      (2) Names of numerals.

      (3) Recognizing number symbols.

         (a) Children can first count rationally to "three."

         (b) Then the symbol "3" is introduced.

7. Ordinal numbers.

   a. Refer to the order or position of a given number in relation to other numbers.

   b. Skills to develop:

      (1) Understanding that the numbers 1-9 fit into a special order from smallest to largest quantity.

      (2) Understanding of the position of numbers and objects.

8. Units of measure.

   a. The use of units of measure with the preschool children should relate directly to their experiences.

   b. Skills to develop:

      (1) Vocabulary usage for various units of measure.

      (2) Internalization of the concept of various units of measure. Note: Abstract concepts such as time and money have little value to preschool children.

9. Simple fractions.

a. Fractions are a part of a whole.

b. Skills to develop:

(1) The use of fractions with preschool children's personal experiences, e.g., "Here is a half a sandwich."

(2) Use of the vocabulary "one-half" and "whole" with three and four-year-olds.

10. Money values.

a. Money has value relative to other goods; yet the value of specific coins is difficult for preschool children.

b. Skills to develop:

(1) An understanding of the function of money.

(2) Use of some vocabulary related to money.

CHAPTER V

TEACHING MATHEMATICS IN THE PRESCHOOL

RATIONALE

The mathematical concepts that young children need to learn are best presented to them in an informal way with emphasis placed on discovery and exploration of materials. Repeated use of concrete objects that can be manipulated will enhance the children's mathematical abilities through increased understanding and retention. This is because children make sense of the world through their own experiences as they interact with their environment. Many authorities are now seeing motor skill involvement as an essential part of effective learning.

Knowledge of the processes by which mathematical skills are developed allows the teacher to plan math experiences appropriate for the level of the individual child as well as take advantage of spontaneous teaching moments that arise.

ESSENTIAL CONTENT INFORMATION

I. Strategies for Teaching Mathematics to Young Children:

A. Coordinate the mathematics program with the entire preschool curriculum.

B. Provide a variety of concrete materials and make them available for the child to use over and over.

C. Take advantage of "teachable moments" that spontaneously occur throughout the day.

D. Relate mathematical concepts that are presented to real life experiences which have meaning to the child.

E. Reinforce concepts previously presented by repeating them over and over and by presenting them in many different ways.

F. Assess the developmental level of each child and provide learning experiences appropriate for each child.

G. Plan for the children to experience mathematic concepts through their senses and with body movement to enhance their internalization of such concepts.

II. Techniques for Teaching Mathematical Skills:

A. Classification.

The grouping of objects according to some like property. The following are examples of classifcation systems and items for sorting:

1. Color---pegs, wooden beads, crayons, felt shapes, etc.

2. Shape---circles together (pop bottle lid, felt circle, sandpaper circle, etc.) and squares together, etc.

3. Size---big objects together, little objects together, etc.

4. Texture---rough objects together, fuzzy objects together, etc.

5. Function---things to play with, things to use in getting dressed, etc.

6. Class--zoo animals together and farm animals together; fruits together and vegetables together, etc.

7. Location---things in a bedroom together; things in a barnyard together, etc.

B. Seriation.

Making two or more comparisons and ordering items along some dimensions. The following are some examples of seriation activities.

1. Size---basketball and softball, set of measuring cups, nested hair rollers, cuisenaire rods, etc.

2. Texture---sandpaper of varying textures; rocks of varying textures; paper, styrofoam, and brick, etc.

3. Soft to Hard---sets of materials such as cotton, foam rubber and wood.

4. Light to Heavy---sets of materials ranging from light to heavy; seies of film cans filled gradually with increasing amounts of b-b's, rice, etc.

5. Other types of seriation activities could be soft to loud sounds, light to dark colors, etc. These would be used with children who have mastered more basic seriation tasks.

C. Elementary Number Concepts.

1. One-to-one correspondence.

Two sets have one-to-one correspondence if each element of one set is exactly duplicated in the other.

2. One-to-one matching activities.

a. Make a row of any type item---checkers, pegs, chess pieces, etc. Ask the children to make a row just like it underneath. When they have finished, ask whether the two rows have the same amount. Ask how they know. They should be able to show you by matching one-to-one.

b. Repeat this type of activity many times with different items.

3. Other types of activities.

a. Have each child match by one-to-one correspondence the number of glasses of milk on the table to the children seated at the table.

b. Have each child match by one-to-one correspondence the number of rhythm band instruments to the number of children.

c. Utilize any opportunity in the preschool, such as those below which allow for one-to-one matching.

D. Conservation.

The amount of matter or space remains the same even though its form is changes.

1. Conservation activities.

a. Place a number of colored chips in a row. Ask the children to make a row underneath the other without mentioning the number. Ask them if there is the same number of each of the colored chips. Ask them to tell you why they say there is the same number.

b. Remove one counter and ask whether there is now the same amount. Then ask them why they say that there is. Add two counters and repeat the questions.

c. Place all counters of one color in a row. Place counters of other color adjacent to the row in a random formation. Ask whether there are the same number of pieces and then discern why the children answered as they did.

d. Ask each child to place the counters which were disarranged in a row to match the arranged row. (Now fix the white pieces so that they are like the green ones.) The counters now look like this:

e. Ask whether there are more of one color or whether they are the same. Ask the children to show you why each answered that way.

f. Repeat this type of activity many times, as long as the children are interested.

2. Other types of conservation activities for the children, not the teacher, to perform over and over:

a. Change clay balls into sausages and reverse.

b. Pour liquid into different sized containers and back so that the apparent amount of liquid changes, e.g., pour from a tall, thin glass into a short wide glass.

c. Stack blocks, take the stack apart, and restack.

E. Geometric Shapes.

The shapes to be introduced in the preschool are the circle, square, and triangle.

1. Children should first experience the shape with their senses, e.g., by feeling large sandpaper or felt shapes they trace with their fingers.

2. Let the children experience the shape motorically, e.g., draw a large circle on the floor and let the children walk around it, crawl around it, etc.

3. Observe the natural environment and look for shapes, e.g., the clock is round.

4. Play games in which children identify shapes through feeling them, e.g., wooden shapes in a feely bag.

F. Sets.

A well-defined grouping or collection. Classification skills are necessary for set-building.

1. Use glass jars with objects inserted to introduce sets.

2. Have children group objects to build sets.

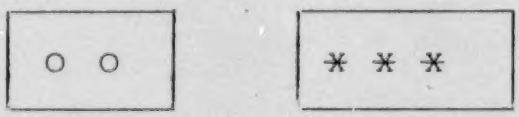
3. Help the children build equivalent sets by matching the components of each set.

4. As the children progress, point out that equivalent sets may have different identifying characteristics such as, a set of 5 bottle tops and 5 pop liners.

5. Use dominoes to match equivalent sets.

6. Use children to make equivalent sets (3 boys and 3 girls).

7. To introduce non-equivalent sets, make two equivalent sets. Add a number to one of the sets, and discuss how they are different.



8. Using glass jars and objects, let the children make their own non-equivalent sets.

9. Give a name to a set.

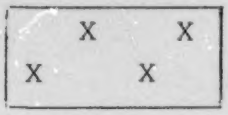
10. Allow children opportunities to reproduce sets made by the teacher.

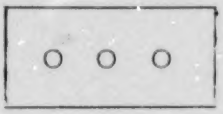
11. Allow children to produce their own sets with objects and verbally label.

12. Ask children to produce a specific number into a set.

13. Help children apply the concept of addition by joining sets of objects, such as a set of 2 balls and a set of 2 balls joined, equals a set of four.

14. Help children apply the concept of subtraction by displaying 2 sets of non-equivalent sets.





Ask questions: How many Xs are in the set? How many Os are in the set? Are they the same in number? How many Xs would we have to take away to make them equivalent?

G. Counting Experiences.

There are two types of counting: rote counting and rational counting.

1. Ask the children to count objects and touch each object as they say its number name.

2. Use a muffin tin or egg carton and place 1 item in the first cup, 2 in the second, etc. Ask the children to count the number of objects in each cup and point to each as they do so.

3. Play many counting games, fingerplays, singing games, etc., which involve rational counting.

4. Give children different manipulative materials such as blocks or wooden chips and ask them to build sets. Sets of two or three should be mastered before advancing to ones containing more.

H. Cardinal Numbers.

The number of objects in a set.

1. Many activities occur as a part of the daily routine which lend themselves to the teaching of cardinal numbers, e.g.:

   a. Counting the number of boys and the number of girls at the table.

   b. Counting the number of objects the children collect on a nature walk.

   c. Looking at the monthly calender and counting how many children have birthdays and then selecting the right numeral to show that.

2. Other activities are planned as part of the program to give practice in the use of cardinal numbers and numerals, e.g.:

   a. Children play number lotto.

   b. Present sandpaper, felt, or written numerals in random order and ask them to name the numeral.

   c. Have the children construct sets and give them sandpaper numerals to label the sets.

I. Ordinal Numbers.

The order or position of a given number in relation to other numbers. It tells which one.

1. Label turns children take in lines or in activities.

2. Have children tell you their first, second, and last names.

3. Have children follow directions involving ordinal positions, such as "Bring me the third book on the shelf.

4. Have children identify the ordinal position of objects in pictures, charts, and on the flannelboard.

5. Have children order objects in sequence. Scramble them and have children reassemble them.

J. Units of Measure.

The use of units of measure with preschool children should relate directly to them and their own experiences.

1. Size---Indicate two objects and ask the children to show the "big" one. Continue this with other comparisons. Introduce "little" into this only after "big" is mastered.

2. Quantity---Have two identical glasses, one containing more water than the other. Ask the children which has "more." Continue this procedure with other comparisons. Introduce the opposite adjective after "more" is mastered.

3. Position---Play directional games with children such as "Simon says to stand 'beside' someone, to get 'under' something," etc.

4. Weight---Introduce the concepts of "heavy" and "not heavy" through lifting objects. Use of simple balance scale good.

5. Time---This is very difficult concept for young children. It should be used in relation to each child's own experience, such as the daily schedule at school or routines at home. Eventually each child can begin to understand the use of tools for measuring time, such as clocks and calendars.

K. Simple Fractions.

The use of fractions with preschool children relates to their personal experiences and are presented informally.

1. Provide sharing opportunities such as "half an apple," "half a sandwich," etc.

2. Compare blocks and other items, "half as big," etc.

3. Plan cooking lessons and use measuring utensils.

4. Measure milk or juice from quart into fractional parts in cups for lunch.

L. Money and Money Values.

Concentrate on the function of money and vocabulary related to the use of money.

1. Allow children to play store in the classroom.

2. Let children pretend to pay for a film they see or special treat with some form of money or ticket.

3. Introduce the relative value of a penny, nickel, and dime to four-year-olds.

CHAPTER VI

ACTIVITY DEVELOPMENT

RATIONALE

Activities for young children must be organized to be effective and require evaluation to determine their effectiveness. Through the use of an activity file card system the individual teacher can better organize his/her time to meet the individual needs of children.

When activity plans are written in a uniform fashion a volunteer, substitute, or aide can become familiar with what is being done. In addition, the file cards provide a useful reference for future teaching of young children.

ESSENTIAL CONTENT INFORMATION

I. Components of an Activity Card.

A. Curriculum Area: e.g., Science.

B. Topic: The theme or area of study, e.g., Plants.

C. Teacher Goal: The overall purpose of the learning activity.

D. Performance Objective: The behavior(s) that the child should be able to perform upon completion of the activity.

E. Materials: A listing of all the items needed for carrying out the activity.

F. Procedure: A sequential listing of all the steps involved in carrying out the activity.

G. Evaluation: A critique of the activity to see whether the performance objectives were accomplished. The evaluation would also include statements useful for future reference about how the activity could be improved, appropriateness to this group level, etc.

II. Setting Up the Activity Card File.

A. A Suggested Curriculum Division.

1. Art.
2. Body Skills.
3. Family.
4. Health.
5. Language.
6. Mathematics.
7. Music.
8. Nutrition.
9. Play.
10. Safety.
11. Science.
12. Self-Concept.
13. Social Science.

B. Procedures for Developing the Activity Card File.

1. Obtain a 5" x 8" file box and file cards.
2. Divide the file into your chosen curriculum divisions.
3. Develop learning activities for each curriculum division to carry out your yearly and weekly program plans.

III. Activity File Card.

Reduced Sample:

Curriculum Area
(Topic)

Teacher Goal:

Objective(s):

Materials:

Procedures:

Evaluation:

SAMPLE ACTIVITY FILE CARD - MATHEMATICS

Curriculum Area
Mathematics
Money

Teacher Goal: Recognize U.S. coins currently in use.

Objective(s): Each child will be able to point to a coin and tell whether it is a penny, nickle, or dime, after a discussion of the three coins.

Materials: Penny, nickle, dime.

Procedures: Hold coin for all to see and find out which children can name them. Name and discuss each coin. Children hold and view each coin, then children name each coin.

Evaluation: Most children already knew these coins. Add quarter, half-dollar, and silver dollar. Dime hard for younger children because it is 10¢, but smaller than the rest.

CHAPTER VII

LEARNING ACTIVITIES

RESOURCE UNIT DEVELOPMENT

Develop a file of five (5) resource units for teaching various concepts of mathematics. These units should be written on 5" x 8" cards for use with the activity file cards which specify the information for teaching the concepts.

Each resource unit will include the "Resource Unit Card" and "Activity File Cards" for teaching the concept. (Use the standard "Resource Unit Card" and the standard "Activity File Card" developed for the CDA program.)

TO BE TURNED IN:

Duplicates of the five "Resource Unit Cards."

NOTE: Activity File Cards to teach the concepts listed on the "Resource Unit Cards" should be developed, but are not to be turned in as a part of this assignment.

RESOURCE UNIT CARD

(Reduced Sample)

Learning Center:			Curriculum Area:		
Concept	Books, Stories, Films	Poems, Finger-plays	Songs, Rhythms, Records	Dramatic Play Themes	Outdoor Activities

(Reverse Side)

Learning Center:			Curriculum Area:		
Concept	Art Activities	Field Trips	Cooking Experiences	Community Visitors	Other

MATHEMATICS RESOURCE INVENTORY

Take an inventory of the materials that you presently have in your room that can be used in the child's learning of mathematics concepts. Write down at least ten of these. Then do the following with each of the ten items:

1. State the mathematics concept that a child could learn with that item.

2. Briefly describe the way in which the item could be used (by the teacher or the child) for learning that mathematics concept.

The format for this assignment is illustrated on the following page.

TO BE TURNED IN:

Your completed inventory form.

Material	Concept to be Learned	How the Item Will be Used for Learning

Learning Activity #2
(Continued)

RESOURCE INVENTORY ADDITIONS

Refer to Learning Activity #2: Mathematics Resource Inventory. Think of other materials that could be added to expand your mathematics center, and write these down on the attached form.

Select ten of these items, and write beside each the mathematics concept that could be taught and the way the item could be used for learning that concept.

TO BE TURNED IN:

Your completed Inventory Additions Form.

Material to be Added	Concept to be Learned	How the Item Will be Used for Learning

Learning Activity #3
(Continued)

LEARNING CENTER - MATHEMATICS

Evaluate the learning center for mathematics in your classroom according to the criteria listed on the attached form. If this center is not currently being used, evaluate it when it is in operation.

To complete the assignment, refer to the qualities found in a good learning center and your resource inventory.

TO BE TURNED IN:

The completed evaluation form of the learning center.

OBSERVATION GUIDE FOR LEARNING CENTERS

I. Interest Centers (general)

A. List the interest centers you see.
B. Are they easily identified? How?
C. Are the quiet centers separated away from the noisy areas?
D. Are they attractive and inviting?
E. Which has attracted the most children? Fewest?

II. Materials and Equipment

A. Is there a good variety?
B. Are materials available to the children?
C. Are they appropriate to the development needs of the children?

III. Pupil-Teacher Interaction

A. What is the pupil-teacher ratio?
B. Do the children behave well when the teacher is looking and badly when the teacher is not watching? Which ones?
C. Does the teacher ever physically express affection for the children?
D. Are concern and understanding expressed for the overly-aggressive child? Tell about it.
E. Are there any "loners" among the children? Who? Can you explain their behavior? Do you notice any adult interaction with these children?
F. Look for positive guidance techniques which are used.
G. How are transition times handled?

1. Is there an advance notice given?
2. Were the children lined up or did they move naturally under supervision?
3. How were the slower children handled?

IV. Mathematics Learning Center

A. What learning centers are available?
B. Is there a mathematics center?
C. Is it arranged as a distinct learning center within the environment?

IV. (Continued)

D. Is it together or separate from similar areas?
E. Are there materials available for experiences in the mathematics center?
F. Is the center arranged to allow the child to explore independently?
G. Is the center attractive and inviting?
H. Is there anything in it that could serve to stimulate curiosity?
I. Are there currently mathematics experiences for self-selected activities?
J. Are there currently-planned mathematics experiences for group activities?
K. List all the equipment that you see in the mathematics center. Are many children attracted to it? Can you suggest any additions or improvements?

V. Physical Setting

A. Draw a diagram of the room, locating all learning centers. Specifically note the placement of the mathematics center.

B. What changes could be made in the room to improve the physical arrangement and utilization of the mathematics center? Be specific.

ACTIVITY FILE CARDS

Develop at least five (5) activities for children in mathematics. Use the uniform activity file card developed by the CDA program for writing up your activities.

(Reduced Sample Card)

Curriculum Area
(Topic)

Teacher Goal:

Objective(s):

Materials:

Procedures:

Evaluation:

TO BE TURNED IN:

Duplicates of the five activity cards, after the activities have been presented.

CONSTRUCTION OF VISUAL AIDS

A. Instructions

1. Construct a visual aid for mathematics.

2. The visual aid will be used for teaching a concept from one of the activity file cards that you developed for Learning Activity #5.

B. Evaluation

After your visual aid has been used, evaluate it according to the following:

a. Effectiveness in teaching the stated goal and concepts for the content area, according to your activity file cards.

b. Attractiveness, durability, originality.

TO BE TURNED IN:

1. A neatly-written description and sketch of the visual aid.

2. A neatly-written description of your evaluation of the visual aid.

COMMUNITY VISITOR - MATHEMATICS

Invite a person in a mathematics profession from your community to come to your center to talk about or teach some aspect of mathematics. This person could be a mathematics teacher, a carpenter, an engineer, etc.

EVALUATION:

After the person has talked to your class, evaluate the effectiveness of the presentation according to the following:

1. Did the theme of the mathematics professional's visit fit into your program for the week?

2. Did you prepare the children well enough beforehand so that they benefitted from the visit?

3. Did you prepare the professional for the visit so that he/she was able to communicate well with the children?

4. Give an example of one child's behavior which showed that he/she learned something from the guest.

5. Could you have done anything differently in preparing for your guest that would have made the visit more effective for the children?

6. What follow-up activities have you done to reinforce the principles or concepts presented by the visitor?

TO BE TURNED IN:

A written evaluation of the visit of a mathematics professional to your classroom, which includes items 1 through 6 of Evaluation, plus any other important information.

PLANNING AND CONDUCTING A FIELD TRIP FOR YOUNG CHILDREN

All students are to plan and conduct a field trip for the various groups of preschool children by completing the following steps:

A. Select and plan a field trip appropriate for your group of preschool children, according to the criteria given for their learning of mathematical concepts.

B. Write a report, in outline form, describing what you did for each step.

C. Fill out the safety checklist (attached).

D. Discuss, in a short paragraph, how your planning for the trip could have been improved.

TO BE TURNED IN:

1. A report, in outline form, on a field trip which you actually conducted with your children.

2. A short paragraph describing how your planning could have been improved.

3. Your safety checklist.

HOW TO PLAN A FIELD TRIP

1. Decide on the purpose of the field trip (in this case, the children's learning of mathematical concepts), and decide whether this is the best way for achieving your learning goal. Among the general questions to ask yourself in regard to a field trip are the following:

   A. Is the length of time required appropriate for the age of the children? Will their routines of eating and sleeping be disturbed? Will they become overtired?

   B. Are the learning experiences to be gained appropriate for the age of the children?

   C. Is this an experience that the children have already had with their parents?

   D. Is the security of any child going to be threatened by leaving school with a stranger who might be helping with the field trip?

2. When a field trip is decided upon as an effective way for helping the children learn certain concepts or gain specific understandings, then list and clarify the objectives for the trip.

3. Select appropriate destination.

4. Obtain administrative approval. Investigate and observe school policies.

5. Contact the place to be visited. Get the name of your contact and discuss the following:

   A. Date
   B. Time of arrival
   C. Duration of trip
   D. Size of group (number of children and adults)
   E. Purpose of trip

6. Make a preliminary visit to gain a better understanding of what the location has to offer. Checklist for preliminary trip:

   A. Anticipate safety hazards
   B. Outline itinerary
   C. Obtain available materials (brochures, literature or pictures)
   D. Determine whether the site fulfills the purposes of the trip
   E. Make detailed plans

7. Confirm the trip by letter or telephone.

8. Obtain written permission from parents. Use forms which state that you will take every reasonable precaution to safeguard the child, but should any unavoidable accident occur, the parent will not hold you or the center responsible. Also, include the following information in "A letter to the parents":

   A. Date
   B. Time
   C. Destination
   D. Means of transportation
   E. The need for money, snack or sack lunch
   F. Appropriate clothing

9. Plan with the children. Tell them beforehand about the trip. This depends on the age of the children and how "big" or important the trip is. Yet never announce it more than two (2) weeks ahead, even for five-year-olds. Stimulate their curiosity by asking open-ended questions, showing appropriate pictures, posters or objects. Draw out questions from them on what they would like to find out. If you use a calendar with the children, let them mark it to indicate the day of the trip. Every day let the children count up to see how many more days until the trip.

10. Arrange transportation. If private cars are used, be sure that the parents have adequate liability insurance. Arrange to have two adults in each car, with one in the back seat. If the children are walking, the number of adults will vary according to the children's ages--with three-year-olds, one adult to two children; with four- and five-year-olds, one adult to four children.

11. Plan again with the children before departure. Use the following checklist:

    A. Dress (button-up, shoes tied)
    B. Name tags (if used)
    C. Behavior on bus or in cars
    D. Courtesy while there
    E. Safety rules
    F. Everyone go to the bathroom

12. After the trip:

    A. Make sure parents sign volunteer sheet.
    B. Talk about the trip with the children.
    C. Plan and execute follow-up learning activities.
    D. Make your own evaluation of the trip.

        1. Were questions (formulated before the trip) answered?
        2. Were there other questions that could have been asked, but were not?
        3. Did the trip meet your objectives?

    E. Write thank-you letter to the host.

SAFETY CHECKLIST FOR TEACHERS PLANNING AN EXCURSION

		YES	NO
1.	Did you plan the trip carefully with the class and with all adults accompanying the children?	____	____
2.	Did you make arrangements for the children to get to their homes safely if the trip should extend longer than planned?	____	____
3.	Are the drivers licensed, competent and insured? Are the vehicles in good condition and insured?	____	____
4.	Did you instruct the children about their conduct in a vehicle? (No moving around once vehicle starts, no hands or arms out windows, no throwing things out windows, remaining in seats.)	____	____
5.	Do children have proper means of identification? (Badge, ribbon, I.D. card, buddy system, group leader, patrols.)	____	____
6.	Do you plan a roll call at various times during the trip?	____	____
7.	Do you have enough adults to supervise the group?	____	____
8.	Do you have a first aid kit with you, and a person trained in administering first aid?	____	____
9.	Did you double check to make sure all pupils going on the trip have signed permission slips on file?	____	____
10.	Did you inform your children to dress for the occasion and for the weather?	____	____
11.	Will there be sufficient time to make the return trip during normal attendance time?	____	____

		YES	NO
12.	Did you make it clear to the group ahead of time that if anyone should be separated from the group, all should meet at a certain time and at a designated place?	____	____
13.	Have you made it clear that you will not permit undesirable behavior during the trip?	____	____
14.	Do you know what to do in event of accident or illness while on the trip?	____	____
15.	Have you checked loading and unloading areas?	____	____
16.	Has special provision been made for handicapped pupils?	____	____
17.	Have pupils made a code of safety for use on field trips?	____	____
18.	Have you planned an evaluation of the trip from the standpoint of safety?	____	____

MEETING INDIVIDUAL NEEDS THROUGH MATHEMATICS

Mathematics activities have many purposes. It is the teacher's responsibility to develop and make available a variety of creative experiences to meet individual needs of children.

On the attached form, list the type activity, the need to be met, and the reason for selecting the activity for each type of child.

TO BE TURNED IN:

Your completed form.

Type Child	Activity	Need Met	Reason
Meticulous (concerned with staying clean)			
Withdrawn			
Non-Verbal			
Aggressive, Over-Active			
Skilled in Fine Motor Development			
Skilled in Large Motor Development			
Unskilled in Fine Motor Development			
Unskilled in Large Motor Development			

VALUES OF ACTIVITIES

Evaluate the five activities you completed in Learning Activity #5 according to the attached form.

TO BE TURNED IN:

Five completed forms on the activities.

VALUES OF ACTIVITIES

Activity Observed:_____

1. Of what value was this experience for the total development of the child? CHECK ONLY THOSE VALUES THAT THIS ACTIVITY WOULD PROVIDE FOR THE CHILD.

a.	Sensory experience	_____
b.	Exploration	_____
c.	Satisfaction and enjoyment	_____
d.	Self-expression	_____
e.	Manipulation	_____
f.	Emotional release	_____
g.	Exercise imagination and initiative	_____
h.	Good work habits	_____
i.	Learning experience	_____
j.	Skill and concentration	_____
k.	Eye-hand coordination	_____
l.	Harmony, rhythm and balance	_____
m.	Insight into own feelings	_____
n.	Development of large muscles	_____
o.	Development of small muscles	_____

2. Can you think of any other values that this activity could provide for young children? Please list.

3. For what age level do you think this activity is most appropriate? Why?

4. What variations of this activity could you use in your classroom? Please describe two.

   a.

   b.

EVALUATION OF

MATHEMATICS ACTIVITIES IN THE PROGRAM

Visit a child development or day care center and observe its activities relating to mathematics. Evaluate what you observed according to the questions on the attached form.

TO BE TURNED IN:

Your completed form.

MATHEMATICS ACTIVITIES IN THE PROGRAM

EVALUATION

1. Did the mathematics activities fit into the daily schedule in terms of active and quiet periods?

2. Did the activities involve the entire class, two or three small groups, one small group, or individual children only?

3. Were the children motivated? That is, did the teacher arouse their interest first?

4. Did each activity appear to be suitable to the developmental level of each child?

5. Did the teacher give needed help (as with how to handle tools), or enough structure to the activity, but not to the extent of unduly restricting creative expression?

6. Did the teacher use any direct guidance? Was it verbal or physical?

7. Did the teacher use any reinforcement techniques? Give exact quote.

8. Did the children appear to enjoy the activity?

9. Were they being creative? What evidence was there?

10. Were the children given an opportunity for exploration with the mathematics medium?

11. Did the children appear to be getting satisfaction and enjoyment from this activity?

12. What other benefits can you name from this learning activity?

STORIES FOR MATHEMATICS

Select three children's stories which contain mathematical concepts. Read these stories to your class and evaluate each one according to the following evaluation form.

TO BE TURNED IN:

Your completed evaluation forms.

EVALUATION

CHILDREN'S BOOKS

TITLE:
AUTHOR:
CONCEPT:

	Fair	Good	Excellent
Was it interesting?			
Was its length appropriate (5 to 15 minutes)?			
Were the pictures simple and appealing?			
How well did it teach the concept?			

Your comments:

FINGERPLAYS - MATHEMATICS

Teach the children three fingerplays which teach concepts of mathematics. Plan the experiences according to the standard CDA activity file card.

TO BE TURNED IN:

An evaluation of each experience, including the words of each fingerplay.

MOBILE OF GEOMETRIC SHAPES

Construct a mobile using the four basic shapes: square, circle, triangle and rectangle. These should be made of different colors of poster board and may be hung from a clothes hanger by a thread or very thin dowel rod.

Use the mobile to teach concepts of shape, following the standard CDA activity file card.

TO BE TURNED IN:

A brief description and/or sketch of the mobile you made, and an evaluation of the activity.

CHAPTER VIII

SUPPLEMENTAL MATERIALS

MATHEMATICS

SUPPLEMENTAL MATERIALS

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   New York: Teachers College Press, Columbia University, 1966.

2. Bell, T. H.
   Your Child's Intellect.
   Salt Lake City, Utah: Olympus Publishing Company, 1973.

3. Biggs, Edith E. and James K. MacLean.
   Freedom to Learn.
   Ontario, California: Addison-Wesley, 1969.

4. Buffie, Edward G., et al.
   Mathematics: Strategies of Teaching.
   Englewood Cliffs, New Jersey: Prentice-Hall, 1968.

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   Diagnostic and Learning Activities in Mathematics for Children.
   New York: Macmillan, 1974.

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   How Children Learn Mathematics.
   New York: Macmillan, 1974.

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   Active Learning: Games to Enhance Academic Activities.
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New York: Random House, 1971.

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American Association of Elem-K-Nursery Educators
1201 14th Street N. W.
Washington, D. C. 20005

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   Brydegaard, Marguerity.
   $1.25

Bank Street College of Education
69 Bank Street
New York, New York 10014

2. Blocks - A Tool of Learning.
   Franklin, Adele.

Brigham Young University Press
Provo, Utah 84601

3. A Teachers' Guide to Cognitive Tasks for Preschool.
   Cahoon, Owen.

Day Care and Child Development Council of America
1012 14th Street N. W.
Washington, D. C. 20005

4. Logical-Mathematical Thinking and the Preschool Classroom.
   Walton, Jeanne.
   $ .75

Early Childhood Education Council of New York City
51 West 4th Street
New York, New York

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Antin, Clara.

ERIC Document Reproduction Service
Computer Microfilm International Corporation
P. O. Box 190
Arlington, Virginia 22210

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Rimoldi, Horacio.
ED 101830.
$1.58

ERIC/ECE Publications Office
University of Illinois
805 West Pennsylvania Avenue
Urbana, Illinois 61801

7. Opening Up the Classroom: A Walk Around the School.
Hucklesby, Sylvia.
ERIC Document 1300-14.
$ .50

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Adkins, Dorothy, et al.
ERIC Document 038168.

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DeVries, Rheta and Constance Kamii.
ERIC Catalog #132.
$1.25

National Education Association
1201 16th Street N. W.
Washington, D. C. 20036

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$1.50

Oklahoma Regional Training Office
University of Oklahoma
555 Constitution
Norman, Oklahoma 73069

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New York: Macmillan, 1970.

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New York: Franklin Watts, 1959.

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New York: Vanguard Press, 1955.

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1 is One.
New York: Oxford Press, 1956.

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One, Two, Where's My Shoe?
New York: Harper and Row, 1964.

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Brian Wildsmith's 1, 2, 3's.
New York: Franklin Watts, 1965.

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Counting Carnival.
New York: Coward, 1962.

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AUDIO-VISUAL RESOURCES

FILMS

Anti-Defamation League
315 Lexington Avenue
New York, New York 10016

1. Bereiter Films: Arithmetic. Rental: $10.00
   B/W, 29 minutes.
   Demonstrates use of simple addition with five-year-olds.

National Film Board of Canada
1221 Avenue of the Americas
New York, New York 10019

2. Mathematics at Your Fingertips. Rental: $17.00
   Color, 27 minutes.
   Depicts in an interesting way the use of Cuisinaire rods in actual classroom use.

Newenhouse/Nova
1825 Willow Road
Northfield, Illinois 60093

3. Functional Teaching of Numbers. Rental: $27.50
   Color, 31 minutes.
   Shows mentally retarded children learning about various aspects of numbers. This film is also of value to teachers of normal children.

New York University Film Library
26 Washington Place
New York, New York 10003

4. AECOM Series of Motor Sensori Development.

   A. Object Permanence. Rental: $16.00
   B/W, 23 minutes.
   Shows the tracking of an object by an infant, and the relationship to cognitive development.

   B. Spatial Relationships.
   B/W, 40 minutes.
   Shows the relationship of cognitive ability and children's awareness of themselves and space.

5. Development of the Child: Cognition. Rental: $30.00
   Color, 29 minutes.
   Shows Piaget's major stages of development in perception, memory, evaluation and reasoning.

6. Piaget's Developmental Theory: Classification. Rental: $12.50
   Color, 17 minutes.
   Allows observation of children in tasks of classifying, class inclusion and hierarchical classification.

7. Piaget's Developmental Theory: Conservation. Rental: $30.00
   Color, 28 minutes.
   Observation and interviews of children five to twelve years of age involved in conservation tasks, with disucssion of test data.

8. What Does it Need to Grow? Rental: $20.00
   Color, 29 minutes.
   Shows processes of problem solving, logical thinking and play in the preschool setting.

Time-Life Films
43 West 16th Street
New York, New York 10011

9. Math is a Monster. Rental: $30.00
B/W, 30 minutes.
Shows how the use of concrete objects helps the child to understand mathematical concepts.